DOCUMENT RESUME

ED 124 573 TM 005 326

AUTHOR Cornett, Joe D.; Askins, Billy E.
TITLE Multiple Correlation as an Extension of One Group Evaluation Designs.
PUB DATE [Apr 76]
NOTE 13p.; Paper presented at the Annual Meeting of the American Educational Research Association (60th, San Francisco, California, April 19-23, 1976)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Academically Handicapped; Bilingual Students; *Correlation; *Evaluation Methods; *Measurement Techniques; Multiple Regression Analysis; Predictor Variables; Preschool Children; Preschool Education; Preschool Programs; *Program Effectiveness; *Program Evaluation; Statistical Analysis
IDENTIFIERS *Multiple Correlation

ABSTRACT

The usefulness of multiple correlation as an extension of one group evaluation designs was investigated. Program participants were measured on the amount of time each spent participating in a specific activity. This information, along with selected personal variables, was used in a correlational analysis to determine the contribution of various program activities and personal variables to the measured changes on the criterion variables. It was found that multiple correlation can provide a wealth of information to decision-makers at a minimum cost. (Author/RC)

**********
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
**********

ED124573

# MULTIPLE CORRELATION AS AN EXTENSION OF ONE GROUP EVALUATION DESIGNS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Joe D. Cornett
Billy E. Askins

Texas Tech University

Many educational evaluators contend that the ideal way to evaluate or measure the impact of an educational program is to impose a rigid experimental design and control for as many extraneous and attribute variables as possible. The results of such a design allows evaluators to make more clearly statements concerning the effects of the educational program without the influence of competing conditions.

However ideal this classical experimental design might be, its use in evaluating educational programs is not commonplace. Evaluators are constantly confronted with situations in which the use of rigid evaluation designs in the evaluation of educational programs is next to impossible. Numerous reasons exist for the sparce use of this ideal evaluation design, but probably the most important is the social and political problems encountered when attempting to randomly assign subjects to experimental and control groups. This problem has become particularly evident to evaluators working with compensatory programs. Even in rare situations where a matched control group can be obtained, the logistics of testing presents a major obstacle along with the lack of control over the control group, i.e., a control group subject attending a similar type program.

---

Paper presented at the American Educational Research Association Meeting, San Francisco, California, April, 1976.

TM005 326

Another major obstacle to employing elaborate experimental designs is the funding arrangements for evaluation. Agencies funding educational programs speak strongly about evaluation, but often fail to support their rhetoric with adequate funds.

As a result of these and other problems, a substantial number of educational programs is utilizing other types of evaluation designs.[1] An examination of evaluation reports submitted to various funding agencies over the past five years revealed a substantial number of educational programs have been evaluated utilizing a basic one group goal attainment model and evaluated utilizing a one group pretest-posttest design. In diagram form, the design can be seen as:

$$T_1 \quad X \quad T_2$$

Where:

$T_1$ = pretest

$T_2$ = posttest

X = treatment (program)

Utilizing this model, the evaluation plan would take measures keyed to program objectives at the beginning of the program, allow the program to progress, and post measure the objectives at the close of the program. Program effectiveness, then, would be determined by the amount of $T_1 - T_2$ difference.

With the severe limitations of this type of design, the best which can be generalized is that gains on the measured variables were made (or not made) and the results were statistically significant or not significant. The results of this type of design leaves unknown the effects of extraneous and attribute variables on the performance of subjects or what aspects of

the program tended to contribute to the performance of the subjects. It is obvious that more information, than can be provided by a one group evaluation design, is needed for intelligent decisions to be made concerning the impact of educational programs.

The purpose of this study was to determine the usefulness of multiple correlation as a technique for providing decision-makers with additional information about educational programs evaluated by one-group procedures.

## Setting

The setting used to test the usefulness of multiple correlation as a program evaluation technique was a federally funded pre-school program entitled, "Responsive Environment Program for Spanish American Children (REPSAC)," located in Clovis, New Mexico.* The program, designed for low birth weight, educationally handicapped 3-, 4-, and 5-year-olds, was designed to provide experiences aimed at developing participants' intellectual ability, language ability in English, language ability in Spanish, sensory and perceptual discrimination, speech development, psychomotor development, self concept, and school readiness. Such experiences were provided with group and individualized or small group activities during a 3-hour day. The group activities were planned and administered using the "responsive environment concept" in a bilingual (Spanish-English) setting. The individual or small group activities included: The Responsive Typing Booth, Project LIFE (Language Improvement to Facilitate Education), Piaget Early Childhood Curriculum, Peabody Language Development Kit,

---

*Project funded by USOE, Bureau of Education for the Handicapped, Handicapped Children's Early Education Program, Grant No. OEG-0-73--710, Project No. H0010SK.

Language Master, and the Frostig Kit.

Due to a number of circumstances, mentioned in the first part of this paper, the use of a randomly assigned experimental-control group design was not possible. Circumstances also prevented the addition of any type of control group. Since the program's inception in 1971, the primary evaluation design used (with the exception of two years when a non-equivalent control group was used) was a pretest-posttest one-group design.

The results of these evaluation efforts have consistently revealed a significant gain in all areas measured except intellectual ability.[2] Although the results of the evaluation provided some information of a useful nature, the need existed for more specific information relating to the relationship between the various program components and the performance of participants. Some indication of the contribution being made to participants' performance of specific instructional activities would provide additional information useful to the program staff. Information regarding the contribution of certain personal factors would also be useful.

## Procedure

Prior to the opening of school, the evaluators and the program staff identified the specific structured program components which were designed to help achieve a specific program objective. In addition, personal factors were identified which could possibly be contributing to the performance of participants. This program analysis yielded ten program variables and six personal variables to be correlated with five of the seven posttest measures. These were:

Posttest Measures (Dependent Variables)

$Y_1$ = learning aptitude

$Y_2$ = language ability in Spanish

$Y_3$ = language ability in English

$Y_4$ = sensory and perceptual discrimination

$Y_5$ = school readiness

Independent Variables

$X_2$ = Peabody Kit (English)

$X_3$ = Piaget Materials (English)

$X_4$ = Language Master (English)

$X_5$ = Peabody Kit (Spanish)

$X_6$ = Piaget Materials (Spanish)

$X_7$ = Language Master (Spanish)

$X_8$ = Typing Booth

$X_9$ = Project LIFE

$X_{10}$ = Frostig Kit

$X_{11}$ = Art Activities

$X_{12}$ = Birth Weight

$X_{13}$ = Age

$X_{14}$ = HELPS Instrument (Henderson Environmental Process Scale)

$X_{15}$ = Number of Siblings

$X_{16}$ = Education of Mother

$X_{17}$ = Monthly Income of Parents

The dependent variables were measured utilizing the following instruments:

(1) Hiskey-Nebraska Test of Learning Aptitude - Intellectual ability

(2) Peabody Picture Vocabulary Test (English and Spanish) - English and Spanish language ability

(3) Frostig Developmental Test of Visual Perception - Sensory and Perceptual discrimination

(4) Walker Readiness Test for Disadvantaged Pre-School Children - School Readiness

The independent variables $X_2$ - $X_{11}$ (program variables) were measured in terms of the amount of time each participant was exposed to the specific instructional activity. A time-log was developed and used by each teacher to record the time. The data for each program variable represented the total amount of time each participant spent at the specific activity during the school year.

Data for the independent variables birth weight, age, number of siblings, education of mother, and monthly income were obtained from records kept by the school. Variable $X_{14}$, parental involvement, was measured by the Henderson Environmental Process Scale (HELPS).

At the end of the school year, posttests were administered both for the purpose of calculating the pre and post differences and to be used as the dependent variable in the multiple correlational analysis.

## Data Analysis

Data were analyzed with a basic linear regression model utilizing the SPSS program - Multiple Regression Analysis: Subprogram Regression.[3]

The SPSS program is a general statistical technique which analyzes the relationship between a dependent variable and a set of independent variables. Multiple regression can be viewed as either a descriptive

tool or as an inferential tool. Since the purpose of using this analysis was to describe the relationship between the post measures and the program and personal variables, conceptually, the technique was viewed as a descriptive tool.

In general, the type of information sought from this technique was:

1. The overall relationship between each of the posttest measures and the sixteen program and personal variables. In addition to the overall relationships, the percentage of variance accounted for by the independent variables was sought.

2. The interrelationships between the sixteen independent variables and the relationship between each independent variable and the dependent variables.

3. The combination of program and personal variables which account for the variance of the posttest measures and could serve as best predictors of dependent variable performance.

## Results

The technique produced the following information concerning the impact of the sixteen program and personal variables on participant performance. Results are presented separately for each posttest measure.

1. Learning aptitude. The sixteen variables correlated .67 with learning aptitude posttest scores explaining 45 per cent of the variance. The three best predictor variables were: Peabody Kit (English), art activities, and number of siblings in family.

2. Language ability in Spanish. The sixteen variables correlated .93 with Spanish posttest scores explaining 86 per cent of the variance.

The six best predictors were: Peabody Kit (English), age, education of mother, Typing Booth, Language Master, and monthly income of family. It is interesting to note that the individual correlation between the amount of time exposed to the Peabody Kit (Spanish) and performance on the Spanish test was -.47.

3. Language Ability in English. The sixteen variables correlated .71 with English posttest scores explaining 50 per cent of the variance. The four best predictors were: Peabody Kit (English), Language Master, Typing Booth, and education of mother.

4. Sensory and perceptual discrimination. The sixteen variables correlated .89 with Frostig posttest scores explaining 79 per cent of the variance. The four best predictor variables were: age, Project LIFE, Typing Booth, and Frostig Kit.

5. School readiness. The sixteen variables correlated .75 with school readiness posttest scores explaining 56 per cent of the variance. The four best predictors were: age, Typing Booth, art activities, and Project LIFE.

Tables 1 and 2 are provided for the purpose of examination. Table 1 represents the individual correlations between the program and personal variables and the posttest scores. Table 2 presents the intercorrelations of the independent variables.

## Conclusion

Multiple correlation as an extension of one group evaluation design appears to be a useful tool for providing additional information about the impact of various program activities and related factors on the performance of program participants. The information should prove valuable to program

planners and other decision makers with regard to activities that seem to be contributing and those that do not appear to be contributing. In this study, for instance, program planners have considerably more data to make program decisions than the pre and post analysis provided.

The technique, obviously, is not without its limitations. Among the most noticeable are the time and effort involved in keeping the time-log, the difficulty in separating the structured experiences from the unstructured ones, and the necessity of computer use which may not be available to some programs.

In addition, using time as a unit of measure has its limitations. Most noticeably, a measure of the quality of exposure time was omitted.

It appears, however, that multiple correlation can provide useful information about an educational program.

TABLE 1

CORRELATIONS BETWEEN TIME EXPOSED TO VARIOUS PROGRAM ACTIVITIES, PEPSONAL FACTORS, AND POSTTEST PERFORMANCE

| POST TEST | VARIABLES* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $X_2$ | $X_3$ | $X_4$ | $X_5$ | $X_6$ | $X_7$ | $X_8$ | $X_9$ | $X_{10}$ | $X_{11}$ | $X_{12}$ | $X_{13}$ | $X_{14}$ | $X_{15}$ | $X_{16}$ | $X_{17}$ |
| PEABODY SPANISH | .43** | -.36* | .07 | -.47** | -.35 | -.25 | .50** | .29 | -.31 | .44** | -.17 | .64*** | .08 | -.26 | .58*** | .50** |
| PEABODY ENGLISH | .27 | -.33* | .24 | -.42** | -.23 | -.18 | .23 | .08 | -.20 | .36* | .08 | .31* | .18 | -.38* | .25 | -.23 |
| WALKER | .29 | -.27 | -.24 | -.24 | -.27 | -.03 | .55*** | .35 | -.20 | .44** | -.30 | .60*** | .12 | .02 | .11 | -.17 |
| HISKEY | .28 | -.07 | -.15 | -.26 | -.04 | -.05 | .07 | .04 | -.15 | .29 | -.07 | -.01 | .18 | .22 | .08 | .17 |
| FROSTIG | .15 | -.32* | -.15 | -.24 | -.21 | -.08 | .57*** | .61*** | .12 | .35* | -.35* | .83*** | .06 | -.07 | .23 | -.05 |

*Significant at the .05 level
**Significant at the .01 level
***Significant at the .001 level

*Legend: Note - $X_2$ through $X_{11}$ represent the measurement of the amount of time each child was exposed to the identified activities; $X_{12}$ - $X_{16}$ represent personal factors

$X_2$ = Peabody Kit (Eng.)
$X_3$ = Piaget Materials (Eng.)
$X_4$ = Language Master
$X_5$ = Peabody Kit (Span.)
$X_6$ = Piaget Materials (Span.)
$X_7$ = Language Master (Sp.)
$X_8$ = Typing Booth
$X_9$ = Project LIFE
$X_{10}$ = Frostig Kit
$X_{11}$ = Art Activities
$X_{12}$ = Birth Weight
$X_{13}$ = Age
$X_{14}$ = HELPS Score
$X_{15}$ = No. of Siblings
$X_{16}$ = Education of Mother
$X_{17}$ = Monthly Income

TABLE 2

INTERCORRELATIONS BETWEEN TIME EXPOSED TO STRUCTURED PROGRAM ACTIVITIES AND SELECTED PERSONAL VARIABLES

| | VARIABLES* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $X_2$ | $X_3$ | $X_4$ | $X_5$ | $X_6$ | $X_7$ | $X_8$ | $X_9$ | $X_{10}$ | $X_{11}$ | $X_{12}$ | $X_{13}$ | $X_{14}$ | $X_{15}$ | $X_{16}$ | $X_{17}$ |
| $X_2$ | | -.17 | -.27 | -.59*** | -.04 | -.40** | .35 | .11 | -.31 | .42** | .10 | .24 | .14 | .12 | .25 | .01 |
| $X_3$ | | | -.12 | .25 | .35 | .38* | -.14 | -.18 | .01 | -.08 | .13 | -.29 | -.13 | -.14 | .06 | .58** |
| $X_4$ | | | | -.09 | -.23 | .02 | -.19 | -.06 | .07 | -.12 | .24 | -.10 | -.32 | -.29 | .13 | -.39* |
| $X_5$ | | | | | .34* | .52*** | -.19 | .10 | .61*** | -.30* | -.12 | -.34 | -.17 | .01 | -.46 | .01 |
| $X_6$ | | | | | | .21 | -.27 | .04 | .01 | -.26 | .23 | .36 | .21 | .21 | -.16 | .42** |
| $X_7$ | | | | | | | .02 | .09 | .22 | .02 | -.29 | -.09 | .03 | .04 | .06 | .08 |
| $X_8$ | | | | | | | | .42** | .09 | .45** | -.46** | .70*** | .19 | .01 | .12 | -.17 |
| $X_9$ | | | | | | | | | .07 | .19 | -.29 | .65*** | .09 | .08 | .14 | .10 |
| $X_{10}$ | | | | | | | | | | .04 | -.22 | -.26 | -.11 | .02 | -.59*** | -.28 |
| $X_{11}$ | | | | | | | | | | | -.31* | .41** | .22 | -.31* | .10 | -.20 |
| $X_{12}$ | | | | | | | | | | | | -.39** | -.06 | -.19 | -.10 | .20 |
| $X_{13}$ | | | | | | | | | | | | | .09 | -.12 | .38* | -.14 |
| $X_{14}$ | | | | | | | | | | | | | | .11 | .08 | .14 |
| $X_{15}$ | | | | | | | | | | | | | | | -.26 | .10 |
| $X_{16}$ | | | | | | | | | | | | | | | | -.01 |
| $X_{17}$ | | | | | | | | | | | | | | | | |

*Significant at the .05
**Significant at the .01
***Significant at the .001

*See Table 1 for Legend

## NOTES

1. See Chapter 9 in W. James Popham, Educational Evaluation, Englewood Cliffs: Prentice-Hall, Inc., 1975. Also note references at the end of chapter as additional sources.

2. Askins, Billy E., et. al., Responsive Environment Program for Spanish American Children (REPSAC): Third Year Evaluation Study. Evaluation Report prepared for USOE (BEH) and the Clovis Municipal Schools, Clovis, New Mexico. (ERIC Document Reproduction Service No. ED 096 086.)

3. Nie, Norman H., et. al., Statistical Package for the Social Sciences, New York: McGraw-Hill Book Company, 1975. See Chapter 20.